MATHEMATICS MCQ BOOKLET

Grade 10 · Chapter 2 · Quadratic Equations

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Independent MCQs on quadratic equations: standard form, factorization, completing the square, the quadratic formula, the discriminant, relations between roots and coefficients, equations reducible to quadratics, simultaneous linear–quadratic systems, and word problems. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.

A. Important / Main Topics

1. An equation of the form $ax^2 + bx + c = 0$ with $a \neq 0$ is called a:

(A) quadratic equation
(B) linear equation
(C) cubic equation
(D) exponential equation

Correct Answer: A

Explanation: The highest power of the unknown is two, so the.

2. In $3x^2 - 7x + 2 = 0$, the leading coefficient a equals:

(A) −7
(B) 3
(C) 2
(D) 0

Correct Answer: B

Explanation: Standard form lists the x^2 term first, so a = 3.

3. The standard form of a quadratic equation requires:

(A) a = 0
(B) b = 0 only
(C) the right-hand side equal to zero
(D) c always positive

Correct Answer: C

Explanation: All terms are collected on one side so the other side is zero.

4. Which equation is NOT quadratic?

(A) $x^2 - 4 = 0$
(B) $5x^2 + x = 0$
(C) $2x^2 = 8$
(D) $3x + 2 = 0$

Correct Answer: D

Explanation: $3x + 2 = 0$ has degree 1, so it is linear, not quadratic.

5. If $x(x - 5) = 0$, then x equals:

(A) 0 or 5
(B) 5 only
(C) 0 only
(D) −5 or 0

Correct Answer: A

Explanation: If $x(x - 5) = 0$, then x equals 0 or 5.

6. If $(x - 3)(x + 2) = 0$, then x equals:

(A) −3 or 2
(B) 3 or −2

(C) 3 or 2
(D) −3 or −2

Correct Answer: B

Explanation: If (x − 3)(x + 2) = 0, then x equals 3 or −2.

7. The factorization of $x^2 - 5x + 6$ is:

(A) (x + 2)(x + 3)
(B) (x − 1)(x − 6)
(C) (x − 2)(x − 3)
(D) (x + 1)(x + 6)

Correct Answer: C

Explanation: (x − 2)(x − 3) expands to $x^2 - 5x + 6$, so the correct choice is (x − 2)(x − 3).

8. Solve $x^2 - 5x + 6 = 0$ by factorization:

(A) x = 1, 6
(B) x = −2, −3
(C) x = 0, 5
(D) x = 2, 3

Correct Answer: D

Explanation: Solve $x^2 - 5x + 6 = 0$ by factorization x = 2, 3.

9. The factorization of $x^2 + x - 6$ is:

(A) (x + 3)(x − 2)
(B) (x − 3)(x + 2)
(C) (x + 1)(x − 6)
(D) (x − 1)(x + 6)

Correct Answer: A

Explanation: $(x + 3)(x - 2) = x^2 + x - 6$, so the factors match.

10. Solve $x^2 + x - 6 = 0$:

(A) x = 3, −2
(B) x = −3, 2
(C) x = 2, 3
(D) x = −2, −3

Correct Answer: B

Explanation: Roots from (x + 3)(x − 2) = 0 are −3 and 2.

11. The factorization of $2x^2 - 7x + 3$ is:

(A) (2x + 1)(x + 3)
(B) (x − 1)(2x − 3)
(C) (2x − 1)(x − 3)
(D) (2x − 1)(x + 3)

Correct Answer: C

Explanation: The factorization of $2x^2 - 7x + 3$ is (2x − 1)(x − 3).

12. Solve $2x^2 - 7x + 3 = 0$:

(A) x = −1/2, −3
(B) x = 1, 3
(C) x = 2, 3
(D) x = 1/2, 3

Correct Answer: D

Explanation: Solve $2x^2 - 7x + 3 = 0$ x = 1/2, 3.

13. The expression $x^2 - 9$ factors as:

(A) (x − 3)(x + 3)
(B) $(x - 3)^2$

(C) $(x + 3)^2$
(D) $(x - 9)(x + 1)$

Correct Answer: A

Explanation: The expression $x^2 - 9$ factors as $(x - 3)(x + 3)$.

14. Solve $x^2 - 9 = 0$:

(A) $x = 9$
(B) $x = \pm 3$
(C) $x = 3$ only
(D) $x = -3$ only

Correct Answer: B

Explanation: Solve $x^2 - 9 = 0$ $x = \pm 3$.

15. The trinomial $x^2 + 6x + 9$ equals:

(A) $(x - 3)^2$
(B) $(x + 9)^2$
(C) $(x + 3)^2$
(D) $(x + 6)^2$

Correct Answer: C

Explanation: $x^2 + 6x + 9$ is a perfect square: $(x + 3)^2$.

16. Solve $x^2 + 6x + 9 = 0$:

(A) $x = 3$
(B) $x = \pm 3$
(C) $x = 6$
(D) $x = -3$ (repeated root)

Correct Answer: D

Explanation: Solve $x^2 + 6x + 9 = 0$ $x = -3$ (repeated root).

17. The zero product property states that if $ab = 0$, then:

(A) $a = 0$ or $b = 0$
(B) $a = b = 0$ always
(C) $a + b = 0$
(D) $a = -b$

Correct Answer: A

Explanation: At least one factor must be zero for the product to vanish.

18. To complete the square on $x^2 + 6x$, the number added inside is:

(A) 3
(B) 9
(C) 6
(D) 36

Correct Answer: B

Explanation: Half of 6 is 3, and $3^2 = 9$ completes the square.

19. Writing $x^2 + 6x + 5$ as $(x + h)^2 + k$ gives h equal to:

(A) -3
(B) 6
(C) 3
(D) 5

Correct Answer: C

Explanation: $x^2 + 6x + 5 = (x + 3)^2 - 4$, so $h = 3$, so the correct choice is 3.

20. For $x^2 - 4x + 1 = (x - 2)^2 + k$, the value of k is:

(A) 1
(B) 3

(C) −1
(D) −3

Correct Answer: D

Explanation: $(x - 2)^2 = x^2 - 4x + 4$, so $k = 1 - 4 = -3$.

21. Completing the square on $x^2 - 4x + 1 = 0$ gives $(x - 2)^2$ equal to:

(A) 3
(B) 1
(C) −3
(D) 4

Correct Answer: A

Explanation: Rearranging yields $(x - 2)^2 = 3$, so the correct choice is 3.

22. Solve $x^2 - 4x + 1 = 0$ by completing the square:

(A) $x = 2 \pm 1$
(B) $x = 2 \pm \sqrt{3}$
(C) $x = 4 \pm \sqrt{3}$
(D) $x = \pm 2$

Correct Answer: B

Explanation: $x - 2 = \pm\sqrt{3}$, so $x = 2 + \sqrt{3}$ or $x = 2 - \sqrt{3}$.

23. The quadratic formula for $ax^2 + bx + c = 0$ is:

(A) $x = (-b \pm \sqrt{(b^2 + 4ac)})/(2a)$
(B) $x = (b \pm \sqrt{(b^2 - 4ac)})/(2a)$
(C) $x = (-b \pm \sqrt{(b^2 - 4ac)})/(2a)$
(D) $x = -b/(2a)$ only

Correct Answer: C

Explanation: The standard formula uses $b^2 - 4ac$ under the square root.

24. For $x^2 - 5x + 6 = 0$, with $a = 1$, $b = -5$, $c = 6$, the value of $-b$ is:

(A) −5
(B) 6
(C) −6
(D) 5

Correct Answer: D

Explanation: Negating $b = -5$ gives $-b = 5$, so the correct choice is 5.

25. The discriminant of $x^2 - 5x + 6 = 0$ is:

(A) 1
(B) 0
(C) −1
(D) 25

Correct Answer: A

Explanation: $D = (-5)^2 - 4(1)(6) = 25 - 24 = 1$, so the correct choice is 1.

26. Using the quadratic formula on $x^2 - 5x + 6 = 0$ gives roots:

(A) $x = -2, -3$
(B) $x = 2, 3$
(C) $x = 5, 6$
(D) $x = 1, 6$

Correct Answer: B

Explanation: $x = (5 \pm 1)/2$, so $x = 3$ or $x = 2$, so the correct choice is $x = 2, 3$.

27. The discriminant of $x^2 + 4x + 7 = 0$ is:

(A) 12
(B) 0

(C) −12
(D) 28

Correct Answer: C

Explanation: D = 4² − 4(1)(7) = 16 − 28 = −12, so the correct choice is −12.

28. If D < 0 and coefficients are real, the roots are:

(A) two distinct real numbers
(B) equal real numbers
(C) both zero
(D) complex conjugates

Correct Answer: D

Explanation: A negative discriminant means the square root is non-real.

29. If D = 0, the quadratic equation has:

(A) one repeated real root
(B) no roots
(C) two distinct real roots
(D) imaginary roots only

Correct Answer: A

Explanation: If D = 0, the quadratic equation has one repeated real root.

30. If D > 0, the quadratic equation has:

(A) equal roots
(B) two distinct real roots
(C) no real roots
(D) exactly one root

Correct Answer: B

Explanation: If D > 0, the quadratic equation has two distinct real roots.

31. The discriminant of $x^2 - 6x + 9 = 0$ equals:

(A) 36
(B) −36
(C) 0
(D) 9

Correct Answer: C

Explanation: D = (−6)² − 4(1)(9) = 36 − 36 = 0, so the correct choice is 0.

32. The roots of $x^2 - 6x + 9 = 0$ are:

(A) −3 and 3
(B) 6 and 0
(C) 9 and 1
(D) 3 and 3

Correct Answer: D

Explanation: (x − 3)² = 0 gives the repeated root 3, so the correct choice is 3 and 3.

33. The discriminant of $x^2 + 2x + 5 = 0$ is:

(A) −16
(B) 16
(C) 0
(D) 4

Correct Answer: A

Explanation: D = 2² − 4(1)(5) = 4 − 20 = −16, so the correct choice is −16.

34. The nature of roots of $x^2 + 2x + 5 = 0$ is:

(A) two distinct reals
(B) non-real (imaginary) roots

(C) equal reals
(D) both zero

Correct Answer: B

Explanation: D = −16 < 0, so no real roots exist, so the correct choice is non-real (imaginary) roots.

35. The discriminant of $x^2 - 3x + 1 = 0$ is:

(A) −5
(B) 9
(C) 5
(D) 1

Correct Answer: C

Explanation: D = $(-3)^2 - 4(1)(1) = 9 - 4 = 5$, so the correct choice is 5.

36. The roots of $x^2 - 3x + 1 = 0$ are:

(A) rational
(B) integers
(C) equal
(D) irrational

Correct Answer: D

Explanation: $\sqrt{5}$ is irrational, so $(3 \pm \sqrt{5})/2$ is irrational.

37. For $2x^2 + 3x - 2 = 0$, the discriminant D equals:

(A) 25
(B) −25
(C) 9
(D) 1

Correct Answer: A

Explanation: D = $3^2 - 4(2)(-2) = 9 + 16 = 25$, so the correct choice is 25.

38. Solve $2x^2 + 3x - 2 = 0$:

(A) x = 2, −1/2
(B) x = 1/2, −2
(C) x = 1, −2
(D) x = −1/2, 2

Correct Answer: B

Explanation: $x = (-3 \pm 5)/4$ gives $x = 1/2$ or $x = -2$, so the correct choice is x = 1/2, −2.

39. For $ax^2 + bx + c = 0$, the sum of roots $\alpha + \beta$ equals:

(A) b/a
(B) c/a
(C) −b/a
(D) −c/a

Correct Answer: C

Explanation: Vieta's formula: $\alpha + \beta = -b/a$, so the correct choice is −b/a.

40. For $ax^2 + bx + c = 0$, the product of roots $\alpha\beta$ equals:

(A) b/a
(B) −b/a
(C) −c/a
(D) c/a

Correct Answer: D

Explanation: Vieta's formula: $\alpha\beta = c/a$, so the correct choice is c/a.

41. For $x^2 - 5x + 6 = 0$, the sum of the roots is:

(A) 5
(B) 6

(C) −5
(D) −6

Correct Answer: A

Explanation: −b/a = −(−5)/1 = 5, so the correct choice is 5.

42. For $x^2 - 5x + 6 = 0$, the product of the roots is:

(A) 5
(B) 6
(C) −6
(D) −5

Correct Answer: B

Explanation: c/a = 6/1 = 6, so the correct choice is 6.

43. If the roots of a quadratic are 2 and 3, their product is:

(A) 5
(B) 1
(C) 6
(D) −6

Correct Answer: C

Explanation: 2 × 3 = 6, so the correct choice is 6.

44. A monic quadratic with roots 2 and 3 is:

(A) $x^2 + 5x + 6$
(B) $x^2 - 5x - 6$
(C) $x^2 + 5x - 6$
(D) $x^2 - 5x + 6$

Correct Answer: D

Explanation: $(x - 2)(x - 3) = x^2 - 5x + 6$, so the correct choice is $x^2 - 5x + 6$.

45. A monic quadratic with roots −1 and 4 is:

(A) $x^2 - 3x - 4$
(B) $x^2 + 3x - 4$
(C) $x^2 - 3x + 4$
(D) $x^2 + 3x + 4$

Correct Answer: A

Explanation: $(x + 1)(x - 4) = x^2 - 3x - 4$, so the correct choice is $x^2 - 3x - 4$.

46. If the sum of roots is 7 and the product is 12, the monic quadratic is:

(A) $x^2 + 7x + 12$
(B) $x^2 - 7x + 12$
(C) $x^2 - 7x - 12$
(D) $x^2 + 7x - 12$

Correct Answer: B

Explanation: $x^2 - (\text{sum})x + \text{product} = x^2 - 7x + 12$, so the correct choice is $x^2 - 7x + 12$.

47. If α and β are roots, then $\alpha^2 + \beta^2$ equals:

(A) $(\alpha + \beta)^2$
(B) $(\alpha + \beta)^2 + 2\alpha\beta$
(C) $(\alpha + \beta)^2 - 2\alpha\beta$
(D) $\alpha\beta$

Correct Answer: C

Explanation: If α and β are roots, then $\alpha^2 + \beta^2$ equals $(\alpha + \beta)^2 - 2\alpha\beta$.

48. For $x^2 - 5x + 6 = 0$, the value of $\alpha^2 + \beta^2$ is:

(A) 25
(B) 12

(C) 5
(D) 13

Correct Answer: D

Explanation: $5^2 - 2(6) = 25 - 12 = 13$, so the correct choice is 13.

49. The expression $1/\alpha + 1/\beta$ equals:

(A) $(\alpha + \beta)/\alpha\beta$
(B) $\alpha\beta/(\alpha + \beta)$
(C) $\alpha + \beta$
(D) $\alpha\beta$

Correct Answer: A

Explanation: Common denominator gives $(\beta + \alpha)/(\alpha\beta)$, so the correct choice is $(\alpha + \beta)/\alpha\beta$.

50. For $x^2 - 5x + 6 = 0$, the value of $1/\alpha + 1/\beta$ is:

(A) 6/5
(B) 5/6
(C) 5
(D) 6

Correct Answer: B

Explanation: $(\alpha + \beta)/\alpha\beta = 5/6$, so the correct choice is 5/6.

51. To solve $x^4 - 5x^2 + 4 = 0$, substituting $y = x^2$ gives:

(A) $y - 5y + 4 = 0$
(B) $x^2 - 5x + 4 = 0$
(C) $y^2 - 5y + 4 = 0$
(D) $y^2 + 5y + 4 = 0$

Correct Answer: C

Explanation: To solve $x^4 - 5x^2 + 4 = 0$, substituting $y = x^2$ gives $y^2 - 5y + 4 = 0$.

52. If $y^2 - 5y + 4 = 0$, then y equals:

(A) −4 or −1
(B) 5 or 4
(C) 2 or 3
(D) 4 or 1

Correct Answer: D

Explanation: If $y^2 - 5y + 4 = 0$, then y equals 4 or 1.

53. From $x^4 - 5x^2 + 4 = 0$ with $y = x^2$, the real solutions for x are:

(A) ±1 and ±2
(B) ±1 only
(C) ±2 only
(D) 1, 2, 4 only

Correct Answer: A

Explanation: $y = 1 \rightarrow x = \pm 1$; $y = 4 \rightarrow x = \pm 2$, so the correct choice is ±1 and ±2.

54. The equation $2^x + 2^{(-x)} = 5$ can be reduced using $u = 2^x$ because $2^{(-x)}$ equals:

(A) u
(B) 1/u
(C) u^2
(D) log u

Correct Answer: B

Explanation: $2^{(-x)} = 1/2^x = 1/u$ when $u = 2^x$, so the correct choice is 1/u.

55. With $u = 2^x$, the equation $2^x + 2^{(-x)} = 5$ becomes:

(A) $u - u = 5$
(B) $u^2 = 5$

(C) u + 1/u = 5
(D) log u = 5

Correct Answer: C

Explanation: Substitute u for 2^x and 1/u for $2^{(-x)}$, so the correct choice is u + 1/u = 5.

56. Multiplying u + 1/u = 5 by u (u ≠ 0) gives the quadratic:

(A) $u^2 + 5u + 1 = 0$
(B) $u^2 - 5u - 1 = 0$
(C) u − 5 = 0
(D) $u^2 - 5u + 1 = 0$

Correct Answer: D

Explanation: Multiplying u + 1/u = 5 by u (u ≠ 0) gives the quadratic $u^2 - 5u + 1 = 0$.

57. The equation 1/x + 1/(x + 1) = 3/4 (x ≠ 0, −1) becomes quadratic after:

(A) clearing fractions with the LCD
(B) taking square roots
(C) subtracting 1 from both sides
(D) ignoring denominators

Correct Answer: A

Explanation: The equation 1/x + 1/(x + 1) = 3/4 (x ≠ 0, −1) becomes quadratic after clearing fractions with the LCD.

58. Given x + y = 5 and $x^2 + y^2 = 13$, the product xy equals:

(A) 12
(B) 6
(C) 13
(D) 25

Correct Answer: B

Explanation: $(x + y)^2 = x^2 + 2xy + y^2$, so $25 = 13 + 2xy$ and $xy = 6$.

59. With x + y = 5 and xy = 6, the numbers x and y satisfy:

(A) $t^2 + 5t + 6 = 0$
(B) $t^2 - 6t + 5 = 0$
(C) $t^2 - 5t + 6 = 0$
(D) $t^2 + 6t + 5 = 0$

Correct Answer: C

Explanation: $t^2 - (x + y)t + xy = t^2 - 5t + 6 = 0$, so the correct choice is $t^2 - 5t + 6 = 0$.

60. The simultaneous system x + y = 5, $x^2 + y^2 = 13$ has real solution pairs:

(A) (1, 4) only
(B) (5, 0) only
(C) no real pairs
(D) (2, 3) and (3, 2)

Correct Answer: D

Explanation: $t^2 - 5t + 6 = 0$ gives t = 2 or 3, so the pairs are (2,3) and (3,2).

61. For x − y = 1 and xy = 6, substituting y = x − 1 into xy = 6 gives:

(A) $x^2 - x - 6 = 0$
(B) $x^2 + x - 6 = 0$
(C) $x^2 - x + 6 = 0$
(D) $x^2 + x + 6 = 0$

Correct Answer: A

Explanation: $x(x - 1) = 6$ expands to $x^2 - x - 6 = 0$, so the correct choice is $x^2 - x - 6 = 0$.

62. The system x − y = 1, xy = 6 has solution pairs:

(A) (2, 3) only
(B) (3, 2) and (−2, −3)

(C) (6, 1) only
(D) no real solution

Correct Answer: B

Explanation: The system $x - y = 1$, $xy = 6$ has solution pairs (3, 2) and (−2, −3).

63. "Product of two consecutive positive integers is 56" translates to:

(A) $n^2 - n - 56 = 0$
(B) $n^2 + 56 = 0$
(C) $n^2 + n - 56 = 0$
(D) $2n = 56$

Correct Answer: C

Explanation: $n(n + 1) = 56$ becomes $n^2 + n - 56 = 0$, so the correct choice is $n^2 + n - 56 = 0$.

64. The positive root of $n^2 + n - 56 = 0$ is:

(A) 8
(B) 56
(C) −7
(D) 7

Correct Answer: D

Explanation: $n = (-1 \pm \sqrt{225})/2 = (-1 \pm 15)/2$, so $n = 7$ (the other root is −8).

65. A rectangle's length exceeds its width by 3 and its area is 54. Width w satisfies:

(A) $w^2 + 3w - 54 = 0$
(B) $w^2 - 3w - 54 = 0$
(C) $w + 3 = 54$
(D) $2w + 3 = 54$

Correct Answer: A

Explanation: Length $w + 3$ gives $w(w + 3) = 54$, so $w^2 + 3w - 54 = 0$.

66. The positive width from $w^2 + 3w - 54 = 0$ is:

(A) 9
(B) 6
(C) 54
(D) 3

Correct Answer: B

Explanation: $w = (-3 \pm \sqrt{225})/2 = (-3 \pm 15)/2$, so $w = 6$ (reject $w = -9$).

67. If travel times t and t + 1 satisfy 60/t + 60/(t + 1) = 11, clearing fractions yields:

(A) a linear equation only
(B) a cubic equation only
(C) a quadratic in t
(D) no equation

Correct Answer: C

Explanation: If travel times t and t + 1 satisfy 60/t + 60/(t + 1) = 11, clearing fractions yields a quadratic in t.

68. Rewritten in standard form, $4 - x^2 + 3x = 0$ becomes:

(A) $x^2 - 3x - 4 = 0$
(B) $x^2 + 3x + 4 = 0$
(C) $-x^2 - 3x + 4 = 0$
(D) $-x^2 + 3x + 4 = 0$

Correct Answer: D

Explanation: Rewritten in standard form, $4 - x^2 + 3x = 0$ becomes $-x^2 + 3x + 4 = 0$.

69. If a quadratic with real coefficients has roots of opposite signs, then c/a is:

(A) negative
(B) positive

(C) zero
(D) always 1

Correct Answer: A

Explanation: If a quadratic with real coefficients has roots of opposite signs, then c/a is negative.

70. If c = 0 in $ax^2 + bx + c = 0$ with $a \neq 0$, one root is always:

(A) 1
(B) 0
(C) −b/a
(D) b/a

Correct Answer: B

Explanation: Factoring x(ax + b) = 0 shows x = 0 is always a root.

71. Solve $3x^2 - 12x = 0$:

(A) x = 3, 4
(B) x = 0, 12
(C) x = 0, 4
(D) x = 4 only

Correct Answer: C

Explanation: 3x(x − 4) = 0 gives x = 0 or x = 4, so the correct choice is x = 0, 4.

72. The equation $x^2 = 7$ has real solutions:

(A) x = 7
(B) x = ±7
(C) none
(D) $x = \pm\sqrt{7}$

Correct Answer: D

Explanation: The equation $x^2 = 7$ has real solutions $x = \pm\sqrt{7}$.

73. For a quadratic with rational coefficients, rational roots require D to be:

(A) a perfect square
(B) always zero
(C) always negative
(D) always 1

Correct Answer: A

Explanation: √D must be rational, so D must be a perfect square of a rational.

74. The equation $x^2 - 4x + 4 = 0$ has roots that are:

(A) distinct irrationals
(B) equal rationals
(C) complex conjugates
(D) of opposite signs

Correct Answer: B

Explanation: The equation $x^2 - 4x + 4 = 0$ has roots that are equal rationals.

75. If $x^2 + px + q = 0$ has roots r and s, then an equation with roots 2r and 2s is:

(A) $x^2 + px + 4q = 0$
(B) $x^2 + 2px + q = 0$
(C) $x^2 + 2px + 4q = 0$
(D) $4x^2 + 2px + q = 0$

Correct Answer: C

Explanation: If $x^2 + px + q = 0$ has roots r and s, then an equation with roots 2r and 2s is $x^2 + 2px + 4q = 0$.

76. Substituting $y = 7 - x$ into $x^2 + y^2 = 25$ gives:

(A) $x^2 + 7x + 12 = 0$
(B) $x^2 - 7x - 12 = 0$

(C) $x - 7 = 0$
(D) $x^2 - 7x + 12 = 0$

Correct Answer: D

Explanation: Substituting $y = 7 - x$ into $x^2 + y^2 = 25$ gives $x^2 - 7x + 12 = 0$.

77. The system $x^2 + y^2 = 25$, $x + y = 7$ has real solution pairs:

(A) (3, 4) and (4, 3)
(B) (5, 0) only
(C) (0, 5) only
(D) no real solution

Correct Answer: A

Explanation: $x^2 - 7x + 12 = 0$ gives $x = 3$ or 4, so pairs are (3,4) and (4,3).

78. The parabola $y = ax^2 + bx + c$ with $a > 0$ opens:

(A) downward
(B) upward
(C) to the right
(D) to the left

Correct Answer: B

Explanation: The parabola $y = ax^2 + bx + c$ with $a > 0$ opens upward.

79. A quadratic equation can have at most this many distinct real roots:

(A) 1
(B) 3
(C) 2
(D) unlimited

Correct Answer: C

Explanation: A quadratic equation can have at most this many distinct real roots 2.

80. Counting multiplicity over the complex numbers, $ax^2 + bx + c = 0$ has exactly:

(A) 1 root
(B) 3 roots
(C) 0 roots
(D) 2 roots

Correct Answer: D

Explanation: Counting multiplicity over the complex numbers, $ax^2 + bx + c = 0$ has exactly 2 roots.

B. Less Important / Secondary Topics

81. The degree (highest power of x) in a quadratic equation is:

(A) 2
(B) 1
(C) 3
(D) 0

Correct Answer: A

Explanation: Quadratic means degree two: the highest power is x^2.

82. The equation $x^2 = 0$ has root:

(A) $x = 2$
(B) $x = 0$ (repeated)
(C) no root
(D) $x = \pm 1$

Correct Answer: B

Explanation: $x^2 = 0$ gives $x = 0$ as a double root, so the correct choice is $x = 0$ (repeated).

83. If $(x - 1)^2 = 0$, then x equals:

(A) −1
(B) 0
(C) 1
(D) 2

Correct Answer: C

Explanation: If $(x - 1)^2 = 0$, then x equals 1.

84. The factorization of $x^2 - 4$ is:

(A) $(x - 4)(x + 1)$
(B) $(x - 2)^2$
(C) $(x + 4)(x - 1)$
(D) $(x - 2)(x + 2)$

Correct Answer: D

Explanation: $x^2 - 4$ is a difference of squares: $(x - 2)(x + 2)$.

85. Solve $x^2 - 4 = 0$:

(A) $x = \pm 2$
(B) $x = \pm 4$
(C) x = 2 only
(D) x = 0

Correct Answer: A

Explanation: $x = 2$ or $x = -2$ satisfies $x^2 = 4$, so the correct choice is $x = \pm 2$.

86. The expression $x^2 + 5x$ factors as:

(A) $(x + 5)^2$
(B) $x(x + 5)$
(C) $x(x - 5)$
(D) $(x + 5)(x - 5)$

Correct Answer: B

Explanation: The expression $x^2 + 5x$ factors as $x(x + 5)$.

87. Solve $x^2 + 5x = 0$:

(A) x = 0, 5
(B) x = 5 only
(C) x = 0, −5
(D) x = −5 only

Correct Answer: C

Explanation: $x(x + 5) = 0$ gives $x = 0$ or $x = -5$, so the correct choice is $x = 0, -5$.

88. In $ax^2 + bx + c = 0$, the coefficient b is attached to:

(A) x^2
(B) the constant term
(C) the discriminant
(D) x

Correct Answer: D

Explanation: In $ax^2 + bx + c = 0$, the coefficient b is attached to x.

89. In $ax^2 + bx + c = 0$, the constant term is:

(A) c
(B) a
(C) b
(D) D

Correct Answer: A

Explanation: c is the term with no factor of x, so the correct choice is c.

90. The equation $x^2 + 1 = 0$ has:

(A) real roots ±1
(B) no real roots
(C) root 0
(D) root −1

Correct Answer: B

Explanation: $x^2 = -1$ has no real solution, so the correct choice is no real roots.

91. The expression $b^2 - 4ac$ is called the:

(A) sum of roots
(B) vertex
(C) discriminant
(D) axis of symmetry

Correct Answer: C

Explanation: The expression $b^2 - 4ac$ is called the discriminant.

92. If D = 0, the roots of a quadratic are:

(A) always imaginary
(B) always of opposite sign
(C) undefined
(D) equal

Correct Answer: D

Explanation: D = 0 means the ± part vanishes, giving one repeated root.

93. The sum of roots of $x^2 - 8x + 15 = 0$ is:

(A) 8
(B) 15
(C) −8
(D) −15

Correct Answer: A

Explanation: $-b/a = -(-8)/1 = 8$, so the correct choice is 8.

94. The product of roots of $x^2 - 8x + 15 = 0$ is:

(A) 8
(B) 15
(C) −15
(D) 23

Correct Answer: B

Explanation: $c/a = 15/1 = 15$, so the correct choice is 15.

95. The roots of $x^2 - 8x + 15 = 0$ are:

(A) −3 and −5
(B) 8 and 15
(C) 3 and 5
(D) 1 and 15

Correct Answer: C

Explanation: $(x - 3)(x - 5) = 0$ gives roots 3 and 5, so the correct choice is 3 and 5.

96. A monic quadratic with roots 1 and 6 is:

(A) $x^2 + 7x + 6$
(B) $x^2 - 7x - 6$
(C) $x^2 + 6$
(D) $x^2 - 7x + 6$

Correct Answer: D

Explanation: $x^2 - (1 + 6)x + 1 \cdot 6 = x^2 - 7x + 6$, so the correct choice is $x^2 - 7x + 6$.

97. The factorization of $x^2 - 7x + 6$ is:

(A) $(x - 1)(x - 6)$
(B) $(x + 1)(x + 6)$
(C) $(x - 7)(x + 1)$
(D) $(x - 2)(x - 3)$

Correct Answer: A

Explanation: $(x - 1)(x - 6) = x^2 - 7x + 6$, so the correct choice is $(x - 1)(x - 6)$.

98. Substituting $y = x^2$ in $x^4 - 13x^2 + 36 = 0$ gives:

(A) $y - 13 + 36 = 0$
(B) $y^2 - 13y + 36 = 0$
(C) $x^2 - 13x + 36 = 0$
(D) $y^2 + 13y + 36 = 0$

Correct Answer: B

Explanation: Substituting $y = x^2$ in $x^4 - 13x^2 + 36 = 0$ gives $y^2 - 13y + 36 = 0$.

99. If $y^2 - 13y + 36 = 0$, then y equals:

(A) 13 and 36
(B) −9 and −4
(C) 9 and 4
(D) 36 only

Correct Answer: C

Explanation: If $y^2 - 13y + 36 = 0$, then y equals 9 and 4.

100. The real solutions of $x^4 - 13x^2 + 36 = 0$ are:

(A) ±9 and ±4
(B) ±13 only
(C) none
(D) ±2 and ±3

Correct Answer: D

Explanation: $y = 9 \rightarrow x = \pm 3$; $y = 4 \rightarrow x = \pm 2$, so the correct choice is ±2 and ±3.

101. If $x + y = 10$ and $xy = 21$, then x and y satisfy:

(A) $t^2 - 10t + 21 = 0$
(B) $t^2 + 10t + 21 = 0$
(C) $t^2 - 21t + 10 = 0$
(D) $t = 10$

Correct Answer: A

Explanation: $t^2 - (x + y)t + xy = t^2 - 10t + 21 = 0$, so the correct choice is $t^2 - 10t + 21 = 0$.

102. The roots of $t^2 - 10t + 21 = 0$ are:

(A) 10 and 21
(B) 7 and 3
(C) −7 and −3
(D) 21 and 1

Correct Answer: B

Explanation: The roots of $t^2 - 10t + 21 = 0$ are 7 and 3.

103. To write $x^2 + 8x + c$ as $(x + 4)^2$, the value of c must be:

(A) 8
(B) 4
(C) 16
(D) 64

Correct Answer: C

Explanation: $(x + 4)^2 = x^2 + 8x + 16$, so $c = 16$, so the correct choice is 16.

104. If $(x + 4)^2 - 9 = 0$, then x equals:

(A) 1 and 7
(B) 4 and −4
(C) 3 only
(D) −1 and −7

Correct Answer: D

Explanation: $x + 4 = \pm 3$ gives $x = -1$ or $x = -7$, so the correct choice is −1 and −7.

105. For $2x^2 - 8x + 6 = 0$ with a = 2, b = −8, c = 6, the discriminant D equals:

(A) 16
(B) −16
(C) 0
(D) 64

Correct Answer: A

Explanation: $D = (-8)^2 - 4(2)(6) = 64 - 48 = 16$, so the correct choice is 16.

106. Dividing $2x^2 - 8x + 6 = 0$ by 2 gives $x^2 - 4x + 3 = 0$ with roots:

(A) 2 and 3
(B) 1 and 3
(C) −1 and −3
(D) 4 and 6

Correct Answer: B

Explanation: $(x - 1)(x - 3) = 0$ gives roots 1 and 3, so the correct choice is 1 and 3.

107. "A number plus its square equals 20" gives the equation:

(A) $n^2 - n - 20 = 0$
(B) $n + 20 = 0$
(C) $n^2 + n - 20 = 0$
(D) $n^2 = 20$ only

Correct Answer: C

Explanation: "A number plus its square equals 20" gives the equation $n^2 + n - 20 = 0$.

108. The positive value of n satisfying $n^2 + n - 20 = 0$ is:

(A) 5
(B) 20
(C) −4
(D) 4

Correct Answer: D

Explanation: $n = (-1 \pm \sqrt{81})/2 = (-1 \pm 9)/2$, so n = 4 (the other root is −5).